

friction becomes very sensibly larger, and does partly, if not mainly, depend upon the permanent rotation to-and-fro of the molecules about their axes. The above-mentioned limit can be widened by allowing the wire to rest after suspension with oscillations at intervals, by annealing, and by repeated heating and cooling.

VII. "Researches in Stellar Photography. 1. In its Relation to the Photometry of the Stars; 2. Its Applicability to Astronomical Measurements of Great Precision." By the Rev. C. PRITCHARD, D.D., F.R.S., Savilian Professor of Astronomy in Oxford. Received May 20, 1886.

(Abstract.)

I. The objects are, first to enquire, by means of accurate measurement, whether there does not exist a definite relation between the area of the disk of a star image impressed on a photographic film and the "photometric magnitude" of that star as determined by instrumental means.

For this purpose, several plates of portions of the Pleiades were taken by varying exposures in the focus of the De la Rue reflector of 13 inches aperture, in the Oxford University Observatory. The diameters of the star disks on these plates were then carefully measured, both with the macro-micrometer and with a double image micrometer, in the same establishment. The result is that the relation sought for is expressed by—

$$D - D' = \delta \{ \log M' - \log M \},$$

where D , D' are the measured diameters of two star disks on the same plate, and M , M' their corresponding "magnitudes," as recorded in the "Uranometria Nova Oxonienses."

The mean difference between the observed and computed magnitudes as derived from the foregoing formula, applied to 28 stars all impressed on each of the four plates and ranging from magnitude 3 to magnitude 9.5, is 0.16 magnitude. A few stars (3) here stand out, in all the plates, as was to be expected, arising from the peculiar actinic action of their spectra. Similar anomalies, as is well known, exist in the application of the photometer.

II. In the next section of the enquiry the effect of alteration of the time of exposure on the areas of the star images is referred to. The enquiry is not fully completed, but as far as it extends, it indicates that for stars not very faint, the areas of the disks of the same star on the same plate vary as the square root of the time of exposure.

Bond in 1858 considered that these areas varied as the time of exposure. Further investigation is required.

III. In the last section the more important question is answered, as to whether, on these modern photographic plates, where the times of exposure are reckoned by hours and minutes rather than by minutes or seconds, measures may be made of relative stellar coordinates as exact and trustworthy as those derived from the best astronomical instruments applied directly to the heavens. For the purposes of this enquiry, resort is made to the same plates of the Pleiades which furnished the results in Section I of this research. The distances of twenty-five stars from Alcyone were measured with the Oxford macro-micrometer: each measure on each of the four plates was repeated the same number of times as Bessel measured the same distances with his Königsberg heliometer. The result of the comparison is slightly in favour of the photographic measures; the average deviations of the repeated measures from the mean being in the case of photographs $0.24''$ and with Bessel's heliometer measures $0.29''$.

A remarkable circumstance fortunately occurred in the course of the measures, in the case of one of the four plates; unmistakable evidence appeared that the photographic film had very slightly but measurably shifted in the neighbourhood of three of the stars, but on no other portions of that plate nor on any portion of any of the other plates. This indicates the unadvisability of relying on any single plate uncorroborated by others.

The applicability therefore of this form of photography to the most precise astronomical measurements seems to be established, even for plates exposed for considerable times. I now propose to test the method still further, by applying it to the determination of stellar parallax.

VIII. "Researches upon the Self-induction of an Electric Current." By Professor D. E. HUGHES, F.R.S. Received May 24, 1886.

Numerous researches have been made upon the self-induction of coils of wire, and but few in relation to the influence exerted by the nature and geometrical sectional form of the electrical conductor when employed in straight wires as in those of a telegraph line with the earth as a return, or those of a single wide loop where the distance of the return wire is sufficient to prevent any appreciable effect from the *mutual induction* of separate portions of the wire upon